

Highly Flexible, Fire Resistant HybridSil Foams for Next Generation Fireproofing, Insulation, and Energy Absorption NASA Applications, Phase I

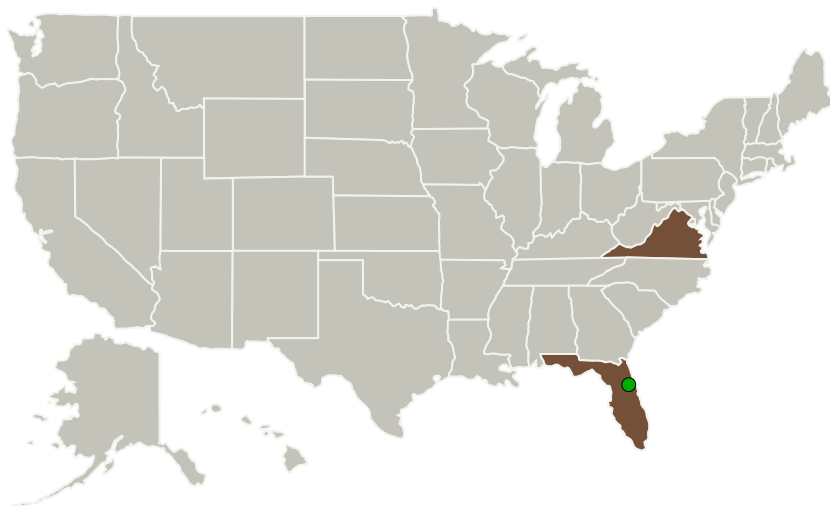
Completed Technology Project (2012 - 2013)



Project Introduction

The objective of this Phase I STTR program is to adapt NanoSonic's HybridSil™ nanocomposite technology for the creation of next generation highly flexible, fire resistant foams capable of extended operational lifetimes within demanding aerospace platforms. Phase I optimized nanocomposite foams would have immediate utility within a broad spectrum NASA applications as non-halogenated fire proofing, insulative, de-icing, and energy absorptive materials with tailorable breathabilities. To that end, NanoSonic and Dr. James McGrath's research group of Virginia Tech will work to design, optimize, and scale-up a family of highly flexible polyimide-polyorganosiloxane HybridSil™ foams with statistically optimized cell content, mechanical durability, thermooxidative resilience, gas permeability, flexibility, and flame retardancy. This program will build from established non-halogenated, high temperature HybridSil™ technology that has passed the ISO 9705 room corner burn test to obtain qualification as "fire restricting" per the International Maritime Organization, demonstrated a flame spread rating of zero (ASTM E-84), yielded thermal conductivities below commercially available polyurethane foams ($< 50 \text{ mW/mK}$), and elastomeric resilience (recovery from 1000 % deformation) from ballistic / blast impact threats . Rapid Phase III transition to commercial integration will be facilitated through an established HybridSil™ pilot scale manufacturing infrastructure capable of producing $> 8,000 \text{ lbs.}$ resin / day.

Primary U.S. Work Locations and Key Partners



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Table of Contents

| | |
|--|---|
| Project Introduction | 1 |
| Primary U.S. Work Locations and Key Partners | 1 |
| Project Transitions | 2 |
| Organizational Responsibility | 2 |
| Project Management | 2 |
| Technology Maturity (TRL) | 2 |
| Technology Areas | 3 |
| Target Destinations | 3 |

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| Organizations Performing Work | Role | Type | Location |
|--|-------------------------|-------------|-------------------------------|
| Nanosonic, Inc. | Lead Organization | Industry | Pembroke, Virginia |
| ● Kennedy Space Center(KSC) | Supporting Organization | NASA Center | Kennedy Space Center, Florida |
| Virginia Polytechnic Institute and State University(VA Tech) | Supporting Organization | Academia | Blacksburg, Virginia |

Primary U.S. Work Locations

| | |
|---------|----------|
| Florida | Virginia |
|---------|----------|

Project Transitions

▶ **February 2012:** Project Start

✓ **February 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138592>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nanosonic, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

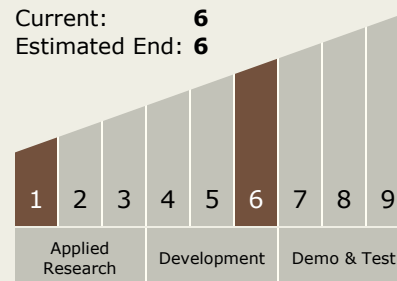
Carlos Torrez

Principal Investigator:

Vince Barnauskas

Technology Maturity (TRL)

Start: 1
Current: 6
Estimated End: 6



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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.4 Environmental Monitoring, Safety, and Emergency Response
 - └ TX06.4.2 Fire: Detection, Suppression, and Recovery

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System